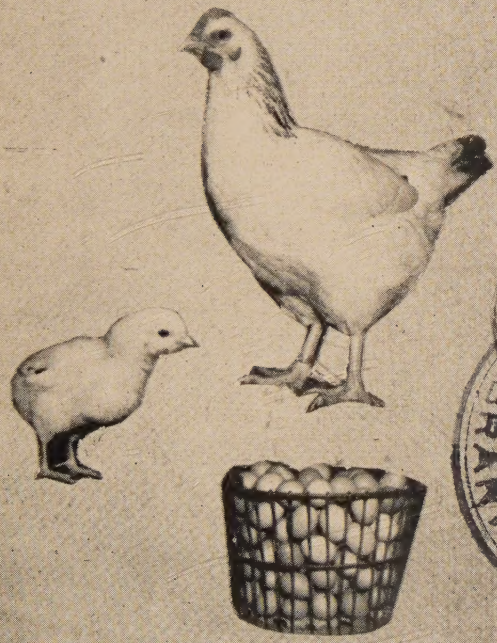
FEEDING CHICKENS

Chicks, Broilers, Laying Hens, and Breeders



UNIVERSITY OF
LIBRARY

OKLAHOMA AGRICULTURAL EXPERIMENT STATION
Oklahoma A. and M. College, Stillwater
Circular No. C-133 May, 1949

OKLAHOMA AGRICULTURAL EXPERIMENT STATION
Oklahoma A. & M. College, Stillwater
W. L. Blizzard, Director Louis E. Hawkins, Vice Director

CONTENTS

	Page
Feed Ingredients	6
Grains and Grain By-products	6
Protein Concentrates	6
Vitamin Supplements	10
Mineral Supplements	11
Making the Mash	12
The A. and M. Mash Formulas	12
Thorough Mixing Essential	12
Materials Must Be Fresh	12
Fine Grinding Undesirable	13
Feeding Methods and Equipment	13
Chicks for Layer and Breeder Flocks	13
Feeders	13
Water Fountains	14
Feeding Schedule	14
Broilers	16
Layer and Breed Hens	17
Feeders	17
Water Fountains	17
Feeding Schedule	18
Growth Rates and Feed Consumption of Chicks	20

FEEDING CHICKENS

Chicks, Broilers, Laying Hens, and Breeders

By ROLLIN H. THAYER and R. B. THOMPSON*

An efficient, well planned feeding system is essential for success in any poultry enterprise. When such a system is followed satisfactory results are obtained at a low feed cost.

An efficient feeding system does three things:

(1) Provides the birds with an ample supply of an adequate, well balanced ration.

(2) Provides a ration which has been mixed for a specific purpose. Nutritive requirements differ for production of layer and breeder replacement stock, broilers, market eggs, and hatching eggs.

(3) Provides the most economical combination of satisfactory feed ingredients. Changes in the prices of feed ingredients must be followed closely, and substitutions made in the standard formulas when such substitutions lower the cost of the ration without significantly changing its nutritional effectiveness.

The feeding system must be followed consistently. An efficient feeding plan loses its value if it is followed only part of the time.

This circular lists rations that have given good results in feeding tests made at the Oklahoma Agricultural Experiment Station. It gives directions for using home-grown feeds to good advantage, either in combination with high quality commercial mashes or in home-mixed mashes. It also describes feeding methods found satisfactory in Station research and in experience with the Oklahoma A. and M. College and Oklahoma Egg Laying Test flocks.

The feeding principles which are discussed apply to commerical as well as home-mixed feeds. These principles will be helpful to the feed manufacturer in formulating mash and scratch grain formulas and in

---

*Respectively: Associate Poultry Husbandman (Nutrition); and Head, Department of Poultry Husbandry.

making necessary substitutions in these feed formulas as required by changes in ingredient cost and supply. With these principles as a guide, the poultry feeder can intelligently select the commercial or home-mixed poultry feed best suited for his needs.

Feed Ingredients

Feed ingredients must meet definite nutritional standards. A high quality feed cannot be made by using low quality or inferior ingredients. When one feed ingredient is substituted for another, the substitute must be the nutritional equal of the one replaced. The following paragraphs suggest some of the substitutions which can be made in the formulas in Tables I, II and III.

GRAINS AND GRAIN BY-PRODUCTS

Any poultry mash should include three or more grains, or grain by-products such as bran. This is essential to provide energy for the efficient digestion of all feed nutrients.

Grain sorghums can be substituted for corn, pound for pound. However, when grain sorghums replace all the corn, the light-colored or white varieties should always be used. The common combine varieties of grain sorghums with dark colored seed coats are unpalatable to poultry. When they are fed, they should be ground and should make up not more than 10 percent of the mash.

Coarsely ground wheat can be used in place of bran and shorts. When wheat is used, the amount of oats or barley in the ration should be increased to provide more fiber. Shrunken wheat has as much feeding value as plump wheat.

Pulverized oats and barley are interchangeable in poultry mashes. When both oats and barley are available, a desirable practice is to use one in the mash and the other in the scratch grain mixture. If only one is available it may be used in both the mash and scratch grain mixture with good results. Oats should be at least standard weight per bushel, and are better if they are heavier.

PROTEIN CONCENTRATES

Animal protein concentrates must be included in all poultry rations. They furnish essential amino acids* and vitamins not found in protein of vegetable origin. One fourth of the total protein in a ration should come from an animal source.

---

* Amino acids are the "building blocks" from which proteins are constructed. As a general rule, proteins from an animal source have a greater variety of amino acids than do proteins from plant sources.

TABLE I—CHICK STARTER AND BROILER MASH FORMULAS (POUNDS)

Ingredients	CS490	CS491	CS492	CS493	CS494	CS495*
Ground yellow corn or kafir	24.0	24.0	24.0	22.0	29.0	61.0
Wheat shorts	20.0	20.0		20.0	20.0	5.0
Wheat bran	10.0	10.0		10.0	10.0	
Ground whole wheat			25.0			
Pulverized oats or barley	10.0	10.0	15.0	10.0	10.0	
Alfalfa leaf meal	10.0	10.0	10.0	10.0	10.0	3.0
Cottonseed meal		5.0	5.0	5.0		5.0
Soybean meal	10.0	5.0	5.0	5.0	10.0	5.0
Meat and bone scrap	10.0	10.0	10.0	10.0	5.0	5.0
Dried buttermilk or skim milk	5.0	5.0	5.0			15.0
Distillers dried solubles				7.0		
Fish meal					5.0	
Salt	1.0	1.0	1.0	1.0	1.0	1.0
Manganese stock solution	0.1	0.1	0.1	0.1	0.1	0.1
Vitamin concentrate **						

* Use for broilers only.

** Use either: (1) "Dry D" and carotene concentrate or "Dry A", each in amounts recommended by manufacturer, or, (2) Vitamin A and D feeding oil in amount recommended by manufacturer.

TABLE II—CHICK GROWER MASH FORMULAS (POUNDS)

Ingredients	CG490	CG491	CG492	CG493	CG494	CG495	CG496
Ground yellow corn or kafir	28.0	28.0	28.0	27.0	33.0	25.0	22.0
Wheat shorts	20.0	20.0		20.0	20.0	25.0	
Wheat bran	10.0	10.0		10.0	10.0	25.0	
Ground whole wheat			25.0				12.0
Pulverized oats or barley	10.0	10.0	15.0	10.0	10.0		10.0
Alfalfa leaf meal	10.0	10.0	10.0	10.0	10.0	8.0	10.0
Cottonseed meal		5.0	5.0	5.0		5.0	
Soybean meal	10.0	5.0	5.0	5.0	5.0		
Ground raw mung beans							30.0
Meat and bone scrap	5.0	5.0	5.0	5.0	5.0	6.0	7.0
Dried buttermilk or skim milk	5.0	5.0	5.0			5.0	8.0
Distillers dried solubles				6.0			
Fish meal					5.0		
Ground limestone or pulverized oystershell	1.0	1.0	1.0	1.0	1.0		
Salt	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Manganese stock solution *	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Vitamin concentrate **							

* Omit if manganese is supplied in limestone or oystershell.

** Use either: (1) "Dry D" and carotene concentrate or "Dry A", each in amounts recommended by manufacturer, or, (2) Vitamin A and D feeding oil in amount recommended by manufacturer. Omit entirely if chicks are fed green feed and have access to direct sunlight.

TABLE III—LAYER AND BREEDER MASH FORMULAS (POUNDS)

Ingredients	CB490	CB491	CB492	CB493	CB494	CB495	CB496	CB497	CB498	CB499	CB4910
Ground yellow corn	15.0	15.0		21.0		22.0	20.0	28.0	27.0	10.0	
Wheat shorts	15.0	15.0	18.0			20.0	20.0	20.0	20.0		10.0
Wheat bran	27.0	27.0	18.0			10.0	10.0	10.0	10.0		10.0
Pulverized barley	15.0	15.0	18.0	21.0		10.0	10.0				
Pulverized oats					21.0			10.0	10.0	10.0	10.0
Ground whole wheat				21.0	21.0						
Ground whole kafir					21.0						16.0
Ground whole wheat or ground whole kafir			18.0							16.0	
Alfalfa leaf meal	6.0	6.0	6.0	1.50	15.0	10.0	10.0	10.0	10.0	10.0	10.0
Cottonseed meal	5.0		5.0	5.0		5.0	5.0	5.0	5.0		
Soybean meal		5.0	5.0		5.0	5.0	5.0	5.0	5.0		
Ground raw mung beans										40.0	30.0
Meat and bone scrap	10.0	10.0	10.0	16.0	16.0	10.0	10.0	10.0	5.0	10.0	5.0
Dried buttermilk	5.0	5.0				5.0					5.0
Distillers dried solubles							7.0				
Fish meal									5.0		
Ground limestone or pulverized oyster shell	1.0	1.0	1.0			2.0	2.0	1.0	2.0	2.0	2.0
Steamed bone meal										1.0	1.0
Salt	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Manganese stock solution *	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Vitamin concentrate **											

* Omit if manganese is supplied in limestone or oystershell.

** Use either: (1) "Dry D" and carotene concentrate or "Dry A", each in amounts recommended by manufacturer, or, (2) Vitamin A and D feeding oil in amount recommended by manufacturer. Omit entirely if hens are fed green feed and have access to direct sunlight.

Fish meal or dried buttermilk are essential in the best chick starter and breeder rations. One or both should be included when they can be obtained.

Distillers dried solubles at a 7 percent level are a suitable substitute for 5 percent of dried buttermilk.

Extensive use should be made of soybean meal, cottonseed meal and ground raw mung beans as vegetable protein sources, since they are readily available in Oklahoma.

Soybean meal and cottonseed meal are interchangeable in poultry rations. Yolk discoloration is apt to occur when market eggs are stored if more than 8 percent of cottonseed meal is included in the laying ration.

Peanut meal may be substituted for one half the cottonseed meal or soybean meal, but must be adequately supplemented with protein from other sources. It is not the nutritional equal of cottonseed meal or soybean meal.

Ground raw mung beans can be used in place of soybean meal and cottonseed meal. Forty percent of a starter, layer or breeder mash may consist of ground raw mung beans with excellent results. Broken or split beans are as good as whole beans for feeding.

VITAMIN SUPPLEMENTS

Young, succulent green feed is the best source of Vitamin A and riboflavin for poultry feeding. In addition it may also contain essential unidentified nutritive factors, one of which may be vitamin B12.

Alfalfa meal is a readily available, low-cost source of Vitamin A and riboflavin. The alfalfa meal should be high in protein (17 percent or more), low in fiber, and should carry a rich green color. A suitable meal for poultry feeding can be made by grinding good quality, leafy, sun-cured alfalfa hay in a hammer mill equipped with a 5/32-inch screen. Alfalfa meal of this kind, however, is not the nutritional equal of a high quality dehydrated leaf meal. Alfalfa meal should be stored in a cool dark place to retard the rate of carotene loss. Ten percent of a good quality alfalfa meal in a ration will meet requirements of poultry for Vitamin A. The addition of other vitamin A or carotene supplements to a ration may be desirable under certain feeding conditions.

Vitamin A concentrates in powdered form are now available for poultry feeding. These concentrates are often referred to as "dry A". Many "dry A's" have been stabilized chemically to prevent or retard the loss of vitamin potency by oxidation.

A carotene concentrate made by extracting the carotene from alfalfa and redissolving it in a suitable oil carrier is available in limited quantities for poultry feeding. Vitamin A in this form can be provided at a much lower cost than in the form of feeding oil. When "dry A" or carotene concentrate is used to supply Vitamin A, Vitamin D must be provided from other sources.

Adequate Vitamin D may be provided by direct sunlight, by Vitamin A and D feeding oil, or in the form of irradiated sterols which are called "dry D."

Vitamin D carriers used for poultry feeding should always have the Vitamin D potency expressed in A.O.A.C. chick units. Many forms of Vitamin D have a low activity for chickens.

Vitamin A and D feeding oil or a combination of "dry D" and carotene concentrate or "dry A", should be added to chick starter rations whenever the chicks do not have access to green feed and direct sunlight. These supplements should always be added to the ration of broilers housed in batteries or confined to a house.

Synthetic riboflavin in a suitable dry carrier is readily available at low cost. Its use is recommended when green feed is not available and the ration does not include riboflavin feedstuffs such as dried buttermilk, fish meal, or distillers dried solubles.

MINERAL SUPPLEMENTS

Mineral supplements of calcium, manganese, and in some cases phosphorous, must be included in poultry rations *when deficiencies exist.* Mineral additions should not be made to a ration unless that ration is *known* to be deficient. The general use of mineral mixtures is not recommended, since over-feeding of one or more minerals is apt to occur. However, one percent of salt and 0.0125 percent of manganese sulfate should be included in all poultry rations.

Calcium is best supplied in the mash in the form of pulverized oystershell or limestone. Laying hens must have oystershell free-choice in addition to that included in the mash.

At least 35 percent of the phosphorus in a ration must be from an inorganic source. This need is usually met when meat and bone scraps are used. If additional phosphorus is needed it can be supplied in the form of steamed bone meal or defluorinated rock phosphate.

Manganese sulfate should be added to all poultry mashes at the

rate of four ounces per ton. A convenient method is to use calcium carbonate to which manganese sulfate has been added. Commercial preparations of this kind are now available on the market. Another satisfactory method is to prepare a manganese solution by dissolving one pound of manganese sulfate in one gallon of water. Two pounds (one quart) of this manganese solution are then added per ton of mash.

Making the Mash

THE A. AND M. MASH FORMULAS

Mash formulas that have been tested by the Oklahoma Station and found satisfactory are listed in Tables I, II, and III, pages 7, 8 and 9. Feed formulas using locally available feedstuffs can be obtained by writing: Poultry Department, Oklahoma A. and M. College, Stillwater, Oklahoma. Letters of inquiry should describe the kind of feed available, and tell the kind of poultry to which it is to be fed.

THOROUGH MIXING ESSENTIAL

Thorough mixing of the mash is essential to insure a uniform distribution of all feed ingredients.

Feeding oil, manganese sulfate solution and vitamin supplements in dry carriers should be premixed with from five to ten pounds of bran, corn or kafir. This premix must be thoroughly mixed and free from lumps before it is added to the mash. A wash tub is a handy container for premixing small batches.

It is also desirable to premix salt and other minerals with a portion of the bran, corn or kafir before adding them to the other mash ingredients.

MATERIALS MUST BE FRESH

Vitamins A and D are destroyed by oxidation in mixed feeds held in storage. The rate of loss is much slower when feed ingredients containing these vitamins are stored separately and mixed into the feed just prior to feeding, because some of the minerals and protein concentrates used in mixed feed hasten the rate of oxidation. Loss of these vitamins is also hastened by high temperatures and free air circulation. As much as 40 percent of the Vitamin A in a mixed feed stored under summer climatic conditions in Oklahoma may be lost during a two-week storage period. As a result poultry feeds which are adequate in Vitamin A when mixed may be deficient when fed.

Loss of Vitamins A and D can be reduced to a minimum by two simple practices:

First, use fresh, high quality feed ingredients when mixing poultry feeds.

Second, store mixed feeds no longer than six to eight weeks in winter or two to four weeks in summer.

FINE GRINDING UNDESIRABLE

Finely ground, powdery feeds are undesirable from both the nutritional and the economic standpoint. Feeding tests show that chickens utilize coarsely ground feeds most efficiently. The additional time and labor spent in fine grinding is therefore wasted. Wheat, corn and grain sorghums, should be ground through a ¼-inch screen. Oats and barley, because of their fibrous nature, are more efficiently utilized if ground through a 3/16 or 1/8-inch screen.

Feeding Methods and Equipment

CHICKS FOR LAYER AND BREEDER FLOCKS

Pullets and cockerels to be used for layer and breeder stock must be allowed to grow at a normal rate. It is not desirable to force them to a maximum rate of growth, as is necessary with broilers. It is essential, however, that they have an adequate and complete ration at all times.

Special attention must be given to providing green feed, water, and an adequate supply of mash and grain during the summer months when the pullets and cockerels are on the range. A setback at this time may mean under-developed, weak birds in the fall.

Feeders

Suitable feeders may be constructed from wood or galvanized iron. Hopper dimensions which will provide adequate feed capacity are as follows:

	Length	Width	Depth
Baby chick feeder	2 to 4 feet	3 ¼ to 4 inches	1 ¾ to 2 in.
Intermediate feeder	3 to 4 feet	5 ½ to 6 ¾ in.	2 ½ to 4 in.

The feeders should be open on top and fitted with a wire guard or reel to prevent the chicks from getting into the feed. Feeders which have small holes for the chicks to eat through are not recommended.

Feeders with adjustable legs are desirable, so height may be adjusted as the chicks grow. Adjust the feeder height so that the chicks can eat comfortably. In this position a minimum of feed will be billed from the hopper and a minimum of litter will be scratched into the hopper.

The feeder legs must extend through the litter and be firmly set on the floor of the brooder house. This helps to prevent the chicks from turning over the feeders and wasting feed.

Intermediate sized feeders of similar construction should replace the small feeders when the chicks are from three to four weeks old. Range feeders which protect the grain and mash from the weather must be provided when the pullets and cockerels are moved to the range.

The following feeder space must be provided if chicks are to get sufficient feed for best growth:

1 to 4 weeks of age — six feet per 100 chicks, or 0.7 of an inch per chick.

4 to 10 weeks of age — twelve to fourteen feet per 100 chicks, or 1.4 to 1.7 inches per chick.

10 to 20 weeks of age — sixteen to twenty feet per 100 chicks, or 1.9 to 2.4 inches per chick.

Water Fountains

Clean, fresh water must be available to chicks at all times. Chicks require enormous amounts of water for the digestion and utilization of their feed, because their growth rate is very rapid as compared with other animals.

One three-gallon water fountain will supply 100 chicks, if cleaned and filled at least twice daily. Running water and automatic fountains, if available, save both time and labor. One automatic or float valve fountain in a 16-inch diameter pan will provide water to not more than 300 chicks.

Water fountains used on the range should be placed on a wire frame over a shallow hole partly filled with sand. This prevents wet, muddy, unsanitary conditions around the fountain when water is spilled.

A hog waterer fastened to an iron drum makes an excellent range fountain. Suitable automatic or float-valve range fountains are also available on the market.

Feeding Schedule

Chicks should be given feed and water when they are 24 to 30 hours old. Chicks purchased from a hatchery should get feed and water as soon as they arrive on the farm.

Arrange the feeders in wheel spoke fashion with the brooder at the center. Place the water fountains between feeders.

For the first feeding the feeders should be filled heaping full. This makes it easier for the chicks to locate the feed. At no other time should the feeders be filled more than two-thirds full; this avoids unnecessary waste of feed. Sprinkling feed on newspaper or egg flats for the first feeding is unsanitary, and does not help the chicks learn to eat.

The water at the first feeding should have the chill removed. No advantage is gained by mixing chemicals in the drinking water.

For the first four weeks, chicks may be fed any one of the chick starter mashes listed in Table I, page 7.

At the end of the fourth week, replace the chick starter with one of the grower mashes listed in Table II, page 8. At this time, also, double the number of feeders and begin feeding a grain mixture in addition to the mash. Suitable grain mixtures are shown in Table IV. Feed chicks grain mixtures consisting of whole grain of a kind small enough for them to handle. When corn is used in the grain mixture it should be coarsely cracked. Begin feeding hard, granite grit to the chicks at the same time grain is added to their ration. Continue feeding grain and mash until the pullets are moved to the laying house.

TABLE IV—CHICK GRAIN MIXTURES (POUNDS)

Ingredient	I	II	III	IV
Whole kafir *	50	50	95	
Whole wheat	45	50		95
Whole oats	5		5	5

* Whole corn can be substituted for kafir when the chicks are big enough to eat the whole corn readily. Coarsely cracked corn may be used in place of the whole kafir if desirable.

Pullets and cockerels for layer or breeder flock replacements grow best on range where adequate green feed and shade are provided. Where a range system is used, the chicks should be moved to the range as soon as they are feathered sufficiently to no longer need brooder heat at night. Chicks are moved to the range when they are 8 to 14 weeks of age.

Adequate range feeders and waterers must be provided. The chicks must never lack for mash, grain, water, grit and green feed during this part of the growing period.

Green feed is an important part of any chick feeding program. Make tender, succulent green feed available to the chicks from the first day. A desirable practice is to finely chop the green feed and feed it in the regular feeders on top of the mash. Careful planning will make it possible to have an adequate supply of green feed available during most months of the year.*

BROILERS

Rapid growth with a high efficiency of feed utilization is essential if broilers are to be produced profitably. This is best accomplished by taking full advantage of the early rapid growth of chicks when economy of gain is at a maximum. Broiler rations and broiler feeding practices have two objectives: First, to maintain a better-than-average growth rate at a low output of feed per pound of gain; and second, to reach market weight in the shortest possible feeding time.

One method of feeding broilers which will give satisfactory results is described below. A more detailed description of broiler feeding methods is given in Okla. Agri. Exp. Sta. Cir. No. C-134, Broiler Production.

Feeding equipment can be the same as described for chicks, but it may be desirable to increase the feeder space per chick to allow for rapid growth. Feeder space is adequate if one-third of the broilers can eat at one time.

The feeding schedule for broilers varies in the following respects from that given for chicks:

Broilers are fed a suitable chick starter mash or broiler mash during the entire feeding period, and no grain mixture is added to the ration. Starter and broiler mash formulas are given in Table I, page 7.

Mashes fed to broilers must contain within themselves all the nutrients required to adequately support an extremely rapid rate of

---

* Full information on growing and using green feed is given in Oklahoma Station Circular C-120, "Planning a Year-Round Poultry Green Feed Program for Oklahoma." It can be obtained from county agents or by writing the Agricultural Mailing Room, Oklahoma A. and M. College, Stillwater, Oklahoma.

growth. Marginal deficiencies which under normal growing conditions would not show up or would be eliminated by green feed tend to show up quickly and are very severe. This is especially true of battery-grown broilers.

Green feed is not usually fed to broilers, since maximum consumption of broiler mash is desired.

Feed consumption can be increased by feeding a crumbly wet mash once each day. Feed only what the broilers will clean up in from 10 to 15 minutes. The wet mash can be made with water, or with liquid milk if it is available. The wet mash is best fed on top of the dry mash in the regular hoppers. Wet mash feeding is not continued for more than a week or ten days just prior to marketing.

LAYER AND BREEDER HENS

Feeders

Mash hoppers must be properly constructed to prevent waste and contamination of feed. The hoppers should be placed on a stand at least 14 inches above the floor to prevent the hens from scratching dirt and litter into the mash. Jump or perch boards make it possible for the hens to reach the feed along the entire length of the hopper.

Adequate hopper space is important in maintaining feed consumption and high egg production. From 20 to 24 feet of hopper space per 100 hens (2.4 to 2.8 inches per hen) should be provided. Two five or six-foot hoppers open on both sides are better than one ten or twelve-foot hopper.

Troughs or boxes may be used for feeding grains; but it is better to feed grain in the litter if the litter is clean, deep and dry and the hen house has a concrete or tight board floor. Separate hoppers must be provided for oyster shell and grit.

Water Fountains

An adequate supply of fresh, clean water must be kept near the mash hoppers at all times. A 12-quart bucket or crock placed on a stand makes a good water container and will supply enough water for about 50 hens. Several types of suitable automatic water fountains are available on the market. These fountains when properly installed, with drainage, provide water at a saving in time and labor.

Fountain warmers of some kind are a necessity during the winter to keep the water from freezing. Several types of satisfactory electric water warmers are on the market. A fountain warmer of this kind soon pays for itself by providing drinkable water for the hens in freezing weather.

Feeding Schedule

A definite feeding routine is a requirement for best results. Do not change, once it is in operation.

Keep a good layer or breeder mash before the birds at all times. Any one of the layer or breeder mashes listed in Table III, page 9, will give satisfactory results. Fill the hoppers only two-thirds full. Add fresh mash each morning. Mix the fresh mash with the mash already in the hopper, and stir the mash in the hoppers several times each day. This will do much to increase the amount of feed eaten, and increased feed consumption means increased egg production in good flocks.

The approximate amounts of grain to be fed daily to each 100 hens are shown in Table V. These amounts can be adjusted to suit the needs of the hens. The amount of grain fed is increased if hens are losing weight. If a slump in egg production occurs, a decrease in the amount of grain fed will help increase mash consumption.

Suitable grain mixtures are given in Table VI. Feed the grain in troughs or scatter it in the litter at mid-afternoon between 3:30 and 4:30 p. m. If morning lights are used, some grain should be scattered in the litter after the hens have gone to roost. This gives the hens an incentive to leave the roosts when the lights are turned on in the morning.

Whole oats may be fed in addition to that which is included in the mash and in the scratch-grain mixture. The oats are put in regular feed hoppers and made available to the hens at all times.

The water fountains should be cleaned and filled each morning and evening—perhaps oftener in warm weather. Water consumption is governed to a great extent by water temperature. Water should be cool in summer and warmed to a temperature of between 45 and 50 degrees in winter.

Feed consumption can be increased by feeding a crumbly wet mash at noon each day. Enough wet mash for 100 hens can be made by mixing two pounds of regular mash with water or skim milk. Feed the wet mash on top of the dry mash in the regular mash hoppers. A slump in egg production can often be avoided if the feeding of wet mash is begun as soon as a drop in feed consumption is observed.

When green feed is available, it should be fed to layer or breeder hens each day. A carefully planned green-feed program will provide a supply of green feed during most months of the year in Oklahoma.

TABLE V—APPROXIMATE DAILY ALLOWANCE OF SCRATCH GRAIN FOR 100 HENS (POUNDS)

Month	Light Breeds	Heavy Breeds
January	12	18
February	12	16
March	12	16
April	12	15
May	10	14
June	10	14
July	8	12
August	8	12
September	8	12
October	10	12
November	12	15
December	12	16

TABLE VI—SCRATCH GRAIN MIXTURES FOR HENS (POUNDS)

Ingredients	I	II	III	IV	V
Whole corn	40		40		40
Whole kafir		40		40	40
Whole wheat	40	40	40	40	
Whole oats			20	20	20
Whole barley	20	20			

Hard, granite grit must be kept before the layers in a separate hopper. Tests have shown that more eggs are produced per hen on less feed when grit is fed to laying hens.

Provide separate hopper for oyster shell. It should be kept well filled and free from litter. The fine powdery oyster shell which the hens do not relish should be removed from the hopper at frequent intervals. Extra calcium is needed by heavy layers in addition to that provided by the layer mash.

Broody hens should be confined to a broody coop and given an adequate supply of grain, mash and fresh water. A wet mash will help to build up body reserves and get them back into production.

Growth Rates And Feed Consumption Of Chicks

Average growth and feed consumption figures for chicks from good Oklahoma-bred strains fed under Oklahoma conditions are given in Table VII, pages 21 to 23. Under broiler feeding conditions comparable weight gains will be made in a shorter length of time at a lower output of feed per pound of gain.

TABLE VII—CHICK GROWTH RATE AND FEED CONSUMPTION; AN AVERAGE UNDER OKLAHOMA FARM CONDITIONS*

Age in Weeks	Weight (Pounds)			Feed Consumption to Age (Pounds)					
				Per Bird			Per pound of gain		
	Males	Females	Both	Males	Females	Both	Males	Females	Both
				WHITE PLYMOUTH ROCKS					
0	0.086	0.085	0.086						
1	0.15	0.14	0.15	0.094	0.092	0.093	1.47	1.67	1.57
2	0.26	0.24	0.25	0.36	0.38	0.37	2.07	2.45	2.26
3	0.41	0.40	0.41	0.94	0.80	0.87	2.90	2.54	2.72
4	0.61	0.59	0.60	1.52	1.56	1.54	2.90	3.09	2.99
5	0.87	0.83	0.85	2.38	2.56	2.47	3.04	3.44	3.24
6	1.18	1.03	1.11	3.43	3.84	3.64	3.14	4.06	3.60
7	1.30	1.17	1.24	4.19	4.76	4.48	3.45	4.39	3.92
8	1.65	1.48	1.57	5.24	5.90	5.57	3.35	4.23	3.79
9	2.15	1.72	1.94	6.68	7.20	6.94	3.24	4.40	3.82
10	2.33	1.87	2.10	8.50	8.48	8.49	3.79	4.75	4.27
11	2.70	2.15	2.43	9.96	9.50	9.73	3.81	4.60	4.21
12	3.00	2.35	2.68	11.71	10.73	11.22	4.02	4.74	4.38
13	3.32	2.50	2.91	13.41	11.88	12.65	4.15	4.92	4.54
14	3.84	2.77	3.31	15.63	13.65	14.64	4.16	5.08	4.62

* A grain mixture added to ration at end of 7th week.

(Table continued on next page)

TABLE VII—(Continued)

Age in Weeks	Weight (Pounds)			Feed Consumption to Age (Pounds)					
				Per Bird			Per pound of gain		
	Males	Females	Both	Males	Females	Both	Males	Females	Both
				BARRED PLYMOUTH ROCKS					
0	0.089	0.088	0.089						
1	0.15	0.14	0.15	0.11	0.13	0.12	1.80	2.50	2.15
2	0.24	0.23	0.24	0.35	0.35	0.35	2.32	2.46	2.39
3	0.40	0.39	0.40	0.73	0.86	0.80	2.35	2.85	2.60
4	0.61	0.59	0.60	1.35	1.75	1.55	2.59	3.49	3.04
5	0.88	0.80	0.84	2.16	2.67	2.42	2.73	3.75	3.24
6	1.14	0.98	1.06	4.06	2.96	3.51	3.87	3.32	3.60
7	1.35	1.16	1.23	4.90	3.79	4.35	3.89	3.54	3.72
8	1.69	1.46	1.58	6.33	4.82	5.58	3.96	3.52	3.74
9	2.08	1.72	1.90	7.90	6.03	6.97	3.97	3.70	3.84
10	2.33	1.90	2.12	9.33	7.71	8.52	4.17	4.26	4.22
11	2.78	2.24	2.51	10.67	8.72	9.70	3.97	4.06	4.02
12	3.10	2.53	2.82	12.33	10.17	11.25	4.10	4.17	4.14
13	3.35	2.76	3.06	13.86	11.48	12.67	4.25	4.30	4.28
14	3.78	2.93	3.36	15.88	13.05	14.47	4.30	4.60	4.45
				RHODE ISLAND REDS					
0	0.086	0.085	0.086						
1	0.14	0.12	0.13	0.093	0.10	0.097	1.72	2.86	2.29
2	0.20	0.19	0.20	0.29	0.29	0.29	2.54	2.76	2.65
3	0.33	0.31	0.32	0.63	0.59	0.61	2.58	2.62	2.60
4	0.63	0.47	0.55	1.09	1.06	1.08	2.00	2.75	2.38

(Table continued on next page)

TABLE VII—(Continued)

RHODE ISLAND REDS (Cont'd)

5	0.69	0.64	0.67	1.76	1.62	1.69	2.91	2.92	2.92
6	0.90	0.80	0.85	2.60	2.40	2.50	3.19	3.36	3.28
7	1.15	0.96	2.06	3.62	3.38	3.50	3.42	3.86	3.64
8	1.30	1.10	1.20	4.64	4.43	4.54	3.83	4.34	4.09
9	1.66	1.47	1.57	5.78	5.43	5.61	3.68	3.91	3.80
10	1.80	1.65	1.73	7.08	6.52	6.80	4.14	4.15	4.15
11	2.27	2.00	2.14	8.70	7.99	8.35	3.99	4.16	4.08
12	2.38	2.07	2.23	10.05	8.83	9.44	4.39	4.44	4.42
13	2.72	2.23	2.48	11.93	10.31	11.12	4.54	4.80	4.67
14	3.09	2.48	2.79	14.30	11.71	13.01	4.77	4.88	4.83

NEW HAMPSHIRES

0	0.098	0.095	0.097						
1	0.14	0.14	0.14	0.13	0.14	0.14	3.10	3.11	3.11
2	0.24	0.23	0.24	0.41	0.40	0.41	2.89	2.96	2.93
3	0.34	0.32	0.33	0.85	0.74	0.80	3.51	3.29	3.40
4	0.52	0.47	0.50	1.28	1.27	1.28	3.03	3.39	3.21
5	0.76	0.68	0.72	2.07	1.99	2.03	3.13	3.40	3.27
6	1.00	0.90	0.95	2.87	2.78	2.83	3.18	3.45	3.32
7	1.15	0.99	1.07	3.80	3.55	3.68	3.62	3.97	3.80
8	1.50	1.28	1.39	4.87	4.55	4.71	3.48	3.82	3.65
9	1.63	1.41	1.52	6.37	5.56	5.97	4.16	4.21	4.19
10	2.17	1.78	1.98	8.25	7.03	7.64	3.99	4.16	4.08
11	2.26	1.87	2.07	9.51	8.46	8.99	4.40	4.75	4.58
12	2.46	2.10	2.28	11.29	9.98	10.64	4.78	4.97	4.88
13	2.63	2.43	2.53	13.21	11.34	12.28	5.22	4.85	5.04
14	3.08	2.60	2.84	14.99	12.91	13.95	5.03	5.14	5.09

6—49—13M